Composition, Structure and Preservation of Endolithic Microbial Communities in the Yellowstone Geothermal Environment

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The endolithic environment, the pore space of rocks, is a ubiquitous habitat for microorganisms on Earth and is an important target of the search for life elsewhere in the Solar System. A lush and unusual endolithic microbial community was discovered recently in highly acidic (~pH 1) chalcedonic sinters in Norris Geyser Basin, Yellowstone National Park, USA[1]. Molecular phylogenetic analysis of this community showed it was dominated by photosynthetic *Cyanidium* species and, surprisingly, *Mycobacterium* species. Electron microscopy revealed the community was subject to silica mineralization and preservation. Here we report endolithic microbial communities are ubiquitous in the Yellowstone geothermal environment in a variety of chemical settings, which select distinct endolithic communities. We determined community composition with rRNA gene-based molecular phylogenetic methods and compared the results with phylogenetic statistical methods. We also investigated the structure of the communities with light and electron microscopy, which included BSE-SEM and EDS analysis of community mineralization. Results show the Yellowstone endolithic communities are subject to mineralization and constitute biomarkers that can become fossilized and potentially preserved in the geological record. Remnants of such communities could serve as biosignatures and provide important clues about ancient life associated with geothermal environments on Earth or elsewhere in the Solar System.

[1]Walker, J.J., J.R. Spear and N.R Pace, A Novel Endolithic Microbial Community in the Yellowstone Geothermal Environment. Submitted.